

adjusting an image forming characteristic of a second exposure apparatus, in accordance with information about image distortion correction capability of said first exposure apparatus; and

✓ further transferring a pattern of a second mask onto said substrate using said second exposure apparatus, after transferring the pattern of said first mask by said first exposure apparatus and adjusting said image forming characteristic of said second exposure apparatus.

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-51 are pending in the present application with Claim 15 having been amended by the present amendment.

In the outstanding Office Action, Claims 26-42 and 49-51 were withdrawn from further consideration by the Examiner; the drawings were objected to; Claims 1-25 and 43-48 were rejected under 35 U.S.C. § 112, second paragraph; and Claims 1-25 and 43-48 were rejected under 35 U.S.C. § 103(a) as unpatentable over Umatate et al in view of Nara et al.

Regarding the objection to the drawings, the outstanding Office Action indicates the drawings fail to show a “main controller 100₁”; and a “main controller 100₂” described in the specification. Applicant notes a main controller 100 is shown in Figure 2 and the reference to the main controllers 100₁ and 100₂ refers to main controllers of exposure apparatuses 20A and 20B, respectively. Thus, any structural detail that is essential for a proper understanding of the disclosed invention is shown in the drawings.

The outstanding Office Action also states the “means to transfer” the substrate from the first exposure apparatus to the second exposure apparatus (as indirectly claimed) must be

shown or the features canceled from the drawings. Applicant notes this feature is not recited in the claims and is a limitation which is not essential to the claims.

Accordingly, it is respectfully requested the objections to the drawings be withdrawn.

Regarding the rejection of Claims 1-25 and 43-48 under 35 U.S.C. § 112, the outstanding Office Action asks several questions concerning the meaning of the claims. In response to these questions, Applicants refer to pages 49-51 in the specification and Figures 1 and 6A-6D. In particular, this section of the specification illustrates a case in which the pattern of the reticle R_2 as a first mask is transferred onto a shot area on a layer (for example, the first layer) on the wafer W using the exposure apparatus 20B as the first exposure apparatus, and then the pattern of the reticle R_1 as the second mask is transferred on top of each shot area on a subsequent layer on the wafer W, which already holds the pattern of the reticle R_2 , using the exposure apparatus 20A as the second exposure apparatus.

First, the main controller 100₂ of the exposure apparatus 20B adjusts its image forming characteristics so that only the symmetrical distortion which can be easily (possibly) corrected by itself is corrected. This adjustment is performed in accordance with the information on the image forming characteristics correction capability of the exposure apparatus 20A, which information is inputted previously via the input unit 21₂ by the operator and stored in the memory device, and in consideration of the fact that the exposure apparatus 20A can easily generate the image distortion component of a parallelogrammatic component, and the main controller 100₂ drives at least either the lens element 27₂ or the reticle stage RST₂ in a predetermined amount along the optical axis direction. When the adjustment is completed, the pattern PA₂ of the reticle R_2 is transferred onto the wafer W in a step-and-repeat manner sequentially, thus forming a parallelogrammatic pattern image PAA (and the image of alignment marks which are not shown), as shown in Fig. 6 (B), on each shot area on

the wafer W. The wafer W is, then, unloaded from the exposure apparatus 20A and the process such as development and resist coating is performed by a coater/developer (not shown in Figs.).

Next, the wafer W which has the parallelogrammatic shot areas formed, is loaded onto the wafer stage WST₁ of the exposure apparatus 20A, and the measurement of the wafer marks and EGA or the like are performed by the alignment sensor 8₁. The step-and-scan exposure is repeated, and the pattern of the reticle R₁ is overlaid and transferred onto each shot area (the parallelogrammatic pattern area) on the wafer W. Upon transferring the pattern of the reticle R₁, the main controller 100₁ of the exposure apparatus 20A performs scanning exposure with the angle between the scanning direction of reticle stage RST₁ and the wafer stage WST₁ being set as a predetermined angle so that the pattern image PAB which includes a parallelogrammatic image distortion, as shown in Fig. 6 (D) is transferred. The main controller 100₁ of the exposure apparatus 20A calculates the parallelogrammatic component mentioned above, in accordance with data on the image forming characteristics correction capability of the exposure apparatus 20B, which data is inputted via the input unit 21₁ by the operator (or inputted from the exposure apparatus 20B through a communication line). The main controller 100₁ then sets the angle between the scanning direction of the reticle stage RST₁ and the wafer stage WST₁, considering the parallelogrammatic component, and controls the angle between the scanning direction of the wafer W and reticle R₁ with respect to the scanning direction of the reticle R₁ via the stage control system 19, thus adjusting the image forming characteristics of the exposure apparatus 20A.

It is believed the above description in the specification answers each of the questions noted in the outstanding Office Action and that Claims 1-25 and 43-48 are definite within the

meaning of 35 U.S.C. § 112, second paragraph. Accordingly it is respectfully requested this rejection be withdrawn.

Claims 1-25 and 43-48 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Umatate et al in view of Nara et al.

With regard to Claim 1, Applicant notes neither Umatate et al nor Nara et al disclose “adjusting an image forming characteristic of a first exposure apparatus to expose one layer on a substrate, in consideration of image distortion correction capability of a second exposure apparatus to expose another layer on the substrate.”

With regard Claim 6, Applicant notes neither Umatate et al nor Nara et al disclose “adjusting an image forming characteristic of a second exposure apparatus, in consideration of an image distortion which is difficult or impossible to be corrected by a first exposure apparatus, which transfers a pattern of a first mask onto a substrate before the second exposure apparatus transfers a pattern of a second mask onto the substrate.”

Further, regarding Claim 7, Applicant notes neither Umatate et al nor Nara et al disclose “adjusting an image forming characteristic of a first exposure apparatus, in consideration of an image distortion which is difficult or impossible to be corrected by a second exposure apparatus, which transfers a pattern of a second mask onto a substrate after the first exposure apparatus transfers a pattern of a first mask onto the substrate”.

With regard to Claim 10, Applicant notes neither Umatate et al nor Nara et al disclose “adjusting an image forming characteristic of a first exposure apparatus to transfer a pattern of a first mask onto a substrate, in accordance with information on an image distortion correction capability of a second exposure apparatus to transfer a pattern of a second mask onto the substrate.”

With regard to Claim 12, Applicant notes neither Umatate et al nor Nara et al disclose “adjusting an image forming characteristic of a first exposure apparatus to transfer a pattern of a first mask onto a substrate so as to leave an image distortion which can be corrected by a second exposure apparatus to transfer a pattern of a second mask onto the substrate.”

With regard to Claim 15, Applicant notes neither Umatate et al nor Nara et al disclose “adjusting an image forming characteristic of a second exposure apparatus, in accordance with information about image distortion correction capability of a fast exposure apparatus to transfer a pattern of a first mask onto a substrate, before the second exposure apparatus transfers a pattern of a second mask onto the substrate.”

In addition, in column 5, line 1 through column 7, line 40 of Umatate et al indicated by the outstanding Office Action, it is only disclosed that exposure is actually performed on a first wafer of a lot, as a pilot wafer, and the result of process on the pilot wafer is measured and analyzed, and then exposure conditions for the wafers within the lot is adjusted.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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IN THE CLAIMS

Please amend Claim 15 to read as follows:

--15. (Amended) An exposure method of forming patterns of a plurality of layers on a substrate using a plurality of exposure apparatus, comprising:

transferring a pattern of a first mask onto said substrate using a first exposure apparatus;

adjusting an image forming characteristic of a second exposure apparatus, in accordance with information about image distortion correction capability of said first exposure apparatus; and

further transferring a pattern of a second mask onto [an area on] said substrate [where said pattern of said first mask is formed,] using said second exposure apparatus [of which said image forming characteristic has already been adjusted], after transferring the pattern of said first mask by said first exposure apparatus and adjusting said image forming characteristic of said second exposure apparatus.--